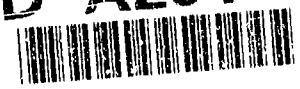

Navy Personnel Research and Development Center
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# Conversion of Live Instruction for Videoteletraining: Training and Classroom Design Considerations

Henry Simpson

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The objective of the work was to refine and document a procedure developed by NPRDC for converting live instruction for delivery via videoteletraining (VTT). The conversion methodology consists of six main steps and their substeps. In step 1, Preparation, a working group is formed and planning occurs. In step 2, Data Collection, the live classroom floor plan is drawn and observations are made of live classroom processes, physical locations of personnel, and timing of classroom events. In step 3, Analysis, class organizational structure and communication flow are analyzed and classroom functional areas are identified. In step 4, VTT Training Design, training activities, materials, aids, and media, and testing supervisory, and administrative procedures are analyzed and converted. In step 5, VTT Classroom Design, the VTT classroom floor plan is designed, audio and visibility requirements are determined, and audiovisual equipment is identified. In step 6, Implementation and Refinement, VTT training and classroom design are implemented, instructors and facilitators are trained, a pilot course is conducted, and training is evaluated and revised. The methodology includes descriptions of three different VTT classroom designs tailored to three different types of courses: (1) lecture-based course, (2) lecture/demonstration with hands-on laboratory, and (3) small-group processes. Suggestions for VTT instructor training are provided.

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# Foreword

This technical note describes work conducted as part of the Navy Personnel Research and Development Center's Communication Networks in Training (CNIT) project in the general area of remote-site training. The CNIT project is one part of the Schoolhouse Training product line and falls under the Personnel and Training Technology (NP2A) Block of the 6.2 Mission Support Technology Program Element 0602233N (Work Unit RM33T23.02). The work was performed under the sponsorship of the Office of Naval Research (Code 222). The objective of the project is to find more cost-effective ways to train personnel who are geographically remote from training resources. The project has been exploring the use of new communication technologies to export training to geographically remote students. Among these technologies are computer networking, instructional TV, videotape, audiographics, videographics, and other media.

This technical note presents a methodology for converting live instruction for videoteletraining (VTT) delivery. The methodology is intended for use by Navy training personnel responsible for either adapting live instruction for VTT or designing VTT classrooms.

The course conversion methodology described in this technical note was developed in close cooperation with Commander, Training Command, U.S. Pacific Fleet (COMTRAPAC) and the Fleet Training Center (FTC), San Diego. The author is indebted to COMTRAPAC and FTC for advice and support. The author would also like to express his appreciation to the reviewers of the methodology: Ms. Jean Ellis and LT Russel Colbert of the Fleet Combat Training Center Atlantic, and Mr. Glenn Griffin of the Naval Education and Training Program Management Support Activity,

J. C. McLACHLAN
Director, Training Research Department

# Summary


## Problem and Background

A requirement exists to train Navy personnel who are geographically remote from training resources. Previous research and development work has demonstrated that videoteletraining (VTT) is an effective and cost-effective method to deliver training electronically to remote Navy personnel. One of the current limitations is lack of a recognized methodology for converting live instruction for VTT delivery.

## Objective

The primary objective of the Communication Networks in Training (CNIT) project is to find more cost-effective ways to train personnel who are geographically remote from training resources. This involves exploring communication technologies to improve the distribution of training. The objective of the work described in this technical note was to refine and document a procedure developed by the Navy Personnel Research and Development Center (NPRDC) for converting live instruction for VTT delivery.

## Approach

The conversion methodology was initially developed during a VTT demonstration project conducted on the west coast and evolved during later course conversions for the VTT laboratory. The methodology was used to develop three different classroom design models which provide concrete examples of its application in the real world.

## Conversion Methodology

The conversion methodology consists of six main steps and their substeps. In step 1, Preparation, a working group is formed and planning occurs. In step 2, Data Collection, the live classroom floor plan is drawn and observations are made of live classroom processes, physical locations of personnel, and timing of classroom events. In step 3, Analysis, class organizational structure and communication flow are analyzed and classroom functional areas are identified. In step 4, VTT Training Design, training activities, materials, aids, media, testing, supervisory, and administrative procedures are analyzed and converted. In step 5, VTT Classroom Design, the VTT classroom floor plan is designed, audio and visibility requirements are determined, and audiovisual equipment is identified. In step 6, Implementation and Refinement, VTT training and classroom design are implemented, instructors and facilitators are trained, a pilot course is conducted, and training is evaluated and revised.

## VTT Classroom Design Models

NPRDC developed three VTT classroom designs in its VTT laboratory at the Fleet Training Center, San Diego, to satisfy the differing needs of three types of courses: (1) lecture-based course, (2) lecture/demonstration with hands-on laboratory, (3) small-group processes. Originating instruction classrooms and remote classrooms do not differ significantly. These designs may serve as models or starting points when developing classroom designs for similar courses.

**Recommendations**

1. The Chief of Naval Education and Training and the Naval Education and Training Program Management Support Activity should distribute this report's conversion methodology and VTT instructor training recommendations within the Navy VTT community for utilization and refinement.

2. The Chief of Naval Education and Training should form a panel of Navy VTT experts to document the final conversion methodology and instructor training recommendations in a NAVEDTRA instruction for use by the Navy training community.

# Contents



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# Introduction

## Problem and Background

A requirement exists to train Navy personnel who are geographically remote from training resources. Previous research and development work has demonstrated that videoteletraining (VTT) is an effective and cost-effective method to deliver training electronically to remote Navy personnel (Simpson, Pugh, & Parchman, 1990, 1991; Rupinski & Stoloff, 1990; Stoloff, 1991). However, VTT technology is new and guidelines for its effective use are limited. One of the current limitations is lack of a recognized methodology for converting live instruction for VTT delivery.

## Objective

The primary objective of the Communication Networks in Training (CNIT) project is to find more cost-effective ways to train personnel who are geographically remote from training resources. This has included exploring communication technologies to aid in the distribution of training. To meet this objective, the project has conducted a VTT demonstration project; a field survey of VTT systems in public education, industry, and the military; and a series of laboratory studies of variables influencing VTT user acceptance and training effectiveness. This project work is reported under separate cover (Pugh, Parchman, & Simpson,1991;Simpson et al., 1990, 1991). The objective of this work described in this technical note was to refine and document a procedure developed by Navy Personnel Research and Development Center (NPRDC) for converting live instruction for VTT delivery.

## Origin of the Methodology

In carrying out the formal research program, NPRDC personnel worked closely with Navy trainers and education specialists to convert several Navy training courses for VTT delivery. The initial course conversions were done informally, but ultimately a systematic conversion methodology evolved. This technical note describes the rationale underlying the methodology, the methodology itself, and gives examples of its application. It is intended to make the methodology available to Navy trainers and others responsible for converting live instruction for VTT delivery. NPRDC regards the methodology as a model rather than a rigorous procedure. Those applying it should recognize its prototypical nature, and adapt it to their particular requirements. The procedure was developed concurrently with procedures developed in the Chief of Naval Education and Training's Electronic Schoolhouse Network (CESN) and documented in the COMTRALANTINST 2000.1 (Commander, Training Command, U.S. Atlantic Fleet, 1992).

# Developing the Conversion Methodology

## Overview

This section provides background information on the conversion methodology covering VTT versus instructional TV, VTT design principles, VTT classroom suggested design guidelines, survey of VTT systems, development of methodology and VTT classroom design models.

Appendixes A and B present the course conversion methodology and checklist respectively.

## VTT Versus Instructional TV

VTT has been influenced by instructional TV (ITV) but differs qualitatively from it.[1] VTT uses continuous 2-way audio with 2-way or 1-way video, students are present in both originating (local) and receiving (remote) classrooms, procedures are very similar to those of a live class, strong emphasis is placed on interactivity, little emphasis is given to TV production values. Traditional ITV is not universally the same, but typically differs from Navy VTT in terms of many of the attributes listed (e.g., use of 1-way video and 1-way audio, students present only in remote classrooms, differences in live and VTT class procedures, little or no interactivity, moderate to high emphasis on TV production values).

The differences between VTT and ITV reflect their different origins. VTT systems derived from videoteleconferencing (VTC) systems, which place strong emphasis on interactivity among small groups of conferees. VTC uses digital compression techniques to allow communication via 2-way TV within narrower bandwidths than are used in ITV. VTT may be viewed as an evolutionary form of ITV, which incorporates features of VTC. Interactivity is arguably the greatest strength of VTT, as it enables VTT to be developed from live training with minimal changes. The more limited interactivity of ITV demands that considerable effort be dedicated to refining training content and delivery to assure that students learn with little or no instructor-student interaction. Moreover, research has demonstrated that interactivity has a significant positive effect on learning in the VTT classroom (Simpson et al., 1991).

In general, there is less emphasis in VTT than in ITV on having the instructor behave as a "performer" in the TV sense. Our experience and that of the CESN is that qualified Navy instructors can become competent VTT instructors with little training; a few hours of familiarization and 2 days of practice before a live class were adequate for most of the instructors who taught in the VTT laboratory at the Fleet Training Center (FTC), San Diego. Appendix C presents suggestions for VTT instructor training. Instructors do not wear makeup, work under lights, read teleprompters, or attend to directors or camera operators. The VTT instructor works in a classroom that is similar to a live classroom.

Consciously or not, VTT users have attempted to mimic live training with VTT. For example, in VTT, students are present in both local and remote classrooms; classrooms physically resemble live classrooms; and students are encouraged to ask questions, make comments, and engage in discussion with the same freedom as they would in a live class. This simplifies adaptation to the new medium by instructors and students, minimizes the amount of instructor training needed and changes to training materials and aids, and allows instructor-student and student-student interaction to occur in ways instructors and students are already familiar with. VTT and live training differ, and converting live training for VTT requires changes, but the changes are usually minor.

VTT users have attempted to minimize training personnel and support requirements. The premise underlying the use of VTT is that it reduces training delivery costs. Proponents of the

[1] The discussion refers to VTT as it has been used within the Chief of Naval Education and Training's Electronic Schoolhouse Network (CESN) (Griffin & Hodgins, 1991; Mahnke, 1989; Rupinski & Stoloff, 1990), west coast VTT demonstration project (Simpson et al., 1990), and NPRDC's VTT laboratory (Simpson et al., 1991).

technology contend that travel and per diem costs of instructors and students will be reduced because both will not have to be at the same location for training to occur. Another contention is that the number of training personnel will be reduced as a single instructor is able to teach multiple classrooms. Costs incurred by the use of VTT undercut its claimed efficiencies, so these costs are minimized. Some ways costs are limited are by not using TV studio personnel (e.g., camera and sound operators, director), little emphasis is given to TV production values, and classrooms are designed to operate with minimal technical support.

## VTT Design Principles

VTT users have developed VTT systems and used them to deliver training without an expressed philosophy, theory, or other explicit principles. The discussion above attempted to capture the implicit VTT design principles these VTT systems incorporate. To the extent that existing VTT systems are regarded as models to emulate, the principles may be used as prescriptions for design. Conversion of live instruction for VTT requires the design of both training (i.e., instruction) and VTT classrooms (i.e., physical spaces with audiovisual equipment) and so the principles are relevant. Restated in prescriptive form, the design principles are:

1. Support interactivity.
2. Mimic live training.
3. Minimize personnel and support requirements.
4. Minimize production complexity.

These principles have several implications and each may be applied in a host of ways.

In addition to these principles, VTT classrooms should employ good human factors in terms of general design principles and context-specific design guidelines. The most relevant human factors principles in the VTT context are simplicity, flexibility, unbreakability, user control, information requirements, and transparency. They underlie important design concepts and should be considered carefully during design.

**Simplicity:** Make designs as simple as possible. A variation on this theme is the minimum functionality principle, which advises designers to determine the minimum number of features their design requires and to provide only those. Simple designs have fewer parts, cost less, are more reliable, and are easier to understand.

**Flexibility:** There is no single correct or ideal design for a VTT classroom. NPRDC has discovered at least three different classroom models (discussed later), and there are certainly others. Different types of classes require different audio and video equipment, floor plans, and other features. Thus, it must be possible to modify the VTT classroom to suit requirements and preferences. Some concrete examples of how this principle applies are to provide movable cameras and TV displays, and cordless microphones that give the instructor freedom of movement.

**Unbreakability:** A simple VTT classroom requires about $60,000 worth of audio and video equipment and much of it is delicate. The VTT classroom must be designed in such a way that this equipment cannot easily be damaged due to wear and tear, accident, carelessness, or neglect. Some concrete examples of how this principle applies are to avoid tripod-mounted cameras (which can easily be knocked over) and exposed cables on the floor. It is better to suspend cameras from the ceiling and run cables under the floor or cover them with protective strips.

**User Control:** Provide VTT users (instructors and students) with control of their environment. Instructors should be able to control all aspects of the VTT classroom (e.g., lighting, camera switching, audio levels). Unlike the ITV classroom, where these matters are usually controlled by media professionals, the instructor should be in control of the VTT classroom either directly or through a surrogate (e.g., facilitator, technician). This principle also applies to students, though in a more limited way. For example, it suggests that students should have push-to-talk microphones, which can be switched off to allow private conversations with other students, rather than sound-activated microphones, which will pick up everything students say, whether intended for broadcast or not.

**Information Requirements:** Provide VTT users with the information they need to perform effectively. Both students and instructor need to see and hear things during training. For example, students need to see and hear the instructor during lectures, demonstrations, classroom discussion, and certain other activities. The instructor needs to hear students and may, under some conditions, need to see them. A particular class may demand that other information requirements be met. To make a course conversion, trainers must identify information requirements and assure that they are met in the VTT version of the course.

**Transparency:** Try to make VTT invisible to users. The technological paraphernalia of VTT (cameras, TV displays, microphones, mixers, loudspeakers, etc.) can be distracting if not made unobtrusive or cleverly concealed. The VTT classroom should not resemble a TV studio or audiovisual equipment warehouse. This principle relates to the idea of mimicking live training with VTT. The more the two are alike, the less adaptation is required by students and instructors. Some concrete examples of how this principle applies are to make the VTT class like the live class in such particulars as floor plans, training materials and aids, and classroom procedures.

### VTT Classroom Suggested Design Guidelines

Suggested design guidelines for the VTT classroom were developed based on NPRDC's experience during the west coast VTT project and during the design of NPRDC's VTT laboratory. The guidelines reflect a combination of human factors and audiovisual industry recommendations, common sense, and NPRDC's opinions about VTT classroom design. They are intended to help designers make decisions about VTT classroom preparation, floor plans, cameras, TV displays, sound, and other technical matters. The guidelines are presented in Appendix A.

### Survey of VTT Systems

During 1990, NPRDC surveyed 13 representative sites engaged in instructional TV, VTT, and teleconferencing (Pugh et al. 1991). The two teleconferencing sites were similar but neither was

used for VTT. These sites used equipment similar to the CESN, but were much better equipped. The survey included the CESN, but not NPRDC's VTT classrooms (which are similar to the CESN's).

The CESN differed significantly from the remaining 10 VTT sites. These 10 sites appeared to be of two different types. The first type of site is a classroom with basic closed-circuit TV whose main features are that (1) production originates from the classroom, (2) students are present, (3) its cameras and audio equipment are remotely operated by a technician in a control room, and (4) production complexity is minimized. The second type of site is an elaborate TV broadcasting studio whose main features are that (1) production originates from the TV studio, (2) students are not present, (3) cameras and audio equipment are operated by technicians present in studio, and (4) production is sophisticated. Instructor-student interaction in both types of sites is constrained by the type of audio systems and limited time allocated for discourse.

Navy VTT sites resemble the first type of site but differ in that cameras and audio equipment are controlled by the instructor with the help of a technician and/or facilitator. Navy VTT sites also generally permit more interaction than either type of site.

### Develop Conversion Methodology

The conversion methodology was initially developed during the west coast VTT demonstration project and evolved during later course conversions for the VTT laboratory. Appendix A presents the Course Conversion Methodology in detail.

### VTT Classroom Design Models

NPRDC developed three different VTT classroom designs in its VTT laboratory at the FTC to satisfy the differing needs of three types of courses: (1) lecture-based, (2) lecture/demonstration with "hands-on" laboratory, and (3) small-group interaction. These designs may be used as models or starting points when designing classrooms for similar courses. The models are described in the VTT Classroom Design Models section of this technical note.

## Conversion Methodology[2]

The conversion methodology consists of six main steps with substeps. The main steps are (1) Preparation, (2) Data Collection, (3) Analysis, (4) VTT Training Design, (5) VTT Classroom Design, and (6) Implementation and Refinement. The relationship among these steps is shown in overview in Figure 1. Steps 1, 2, and 3 are sequential, but lead to two parallel steps (4, 5), which culminate in step 6. The process is intended to be iterative; hence, Figure 1 shows a feedback loop from step 6 to step 3, and cross-links between steps 4 and 5.

The methodology should be treated as a general approach, not a rigid procedure. Each step highlights factors important to consider in performing a conversion, although the significance of substeps will vary with particular cases. A checklist based on this procedure is contained in Appendix B to help users apply the methodology.

[2] The implementation of some aspects of this methodology is described in Simpson et al. (1990). It would be useful to readers who want to apply the methodology to review that report.

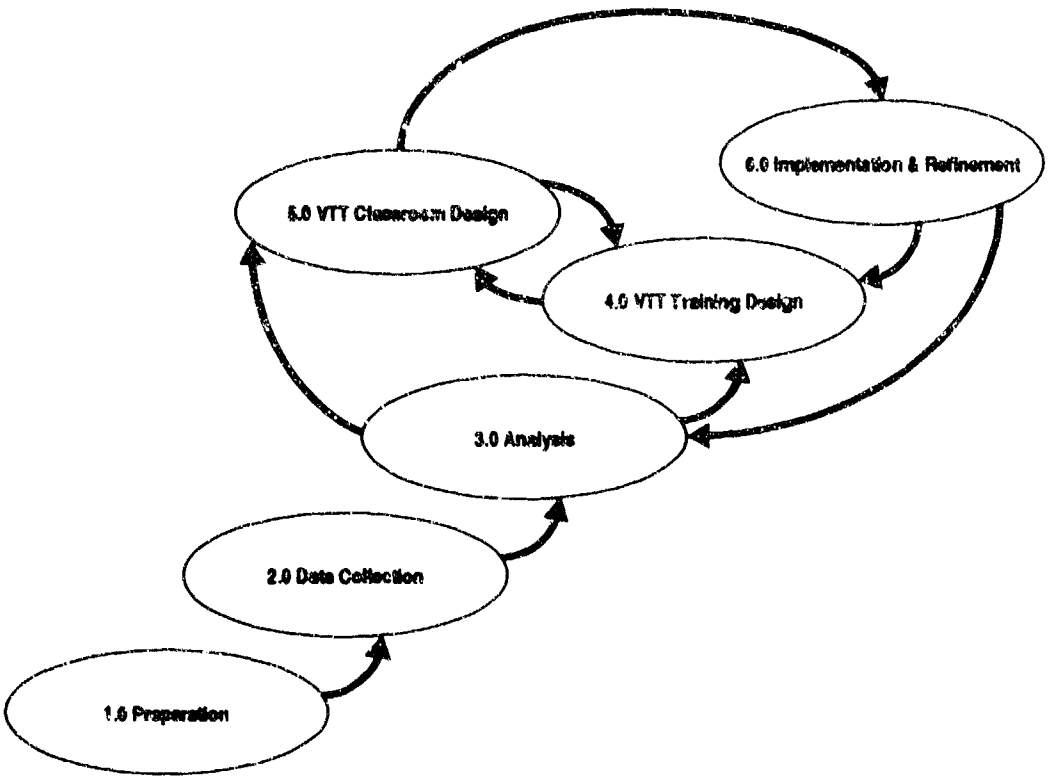


**Figure 1. Sequence of steps in course conversion methodology.**

# VTT Classroom Design Models

## Overview

NPRDC developed three different VTT classroom designs in its VTT laboratory at the FTC to satisfy the differing needs of three different types of courses: (1) lecture-based course, (2) lecture/ demonstration with hands-on laboratory, and (3) small-group processes. Originating and remote classrooms did not differ significantly. These designs may serve as models or starting points when developing classroom designs for similar courses.

## Model 1: Lecture based Course

Model 1 is considered to be suitable for most lecture-based courses and for the lecture and discussion portions of other Navy courses. Model 1 was developed after an analysis of the Maintenance, Material Management system Administration and Operations (3M) course. The model was used to deliver 3M and Safety Petty Officer courses. It is also the basis of Model 2, with which it shares many common features. 3M is a lecture-based course. During most of the course, the instructor lectures from a stationary lectern at the front of the classroom and information flows from instructor to students; instructor camera and microphone are needed to capture the instructor's picture and voice.

During the lecture, the instructor asks students questions and they answer, speaking to the entire class and class discussion occurs; microphones are needed to pick up student voices. The instructor observes students and maintains order in class; along with student microphones, the remote class needs a camera so that the instructor can see students.

The instructor illustrates the lecture with many projected transparencies and may annotate them with a marker. In the VTT class, transparencies are converted to hard copy form and an easel camera is used to capture their images; the easel camera is also used instead of a writing board.

During laboratory sessions, students complete classroom exercises and use reference materials and fill out forms. The instructor strolls through the room, looking over student shoulders, answering questions, and providing individual help as requested. The instructor cannot physically stroll through the remote class, but its students can present their work to him or her with an easel camera or facsimile machine. Private communication is possible with a telephone.

Students complete written tests; during testing, a student may ask the instructor a question that is not to be broadcast to the entire class. A telephone is needed to enable private conversation between instructor and a single student at the remote classroom.

The training analysis indicated that all students in local and remote classrooms need access to a microphone and the following additional capabilities: camera on instructor (local classroom only), camera on class, easel camera, video switch, facsimile machine, and telephone.

Figure 2 shows the floor plan for a Model 1 classroom. Students sit at tables, with two chairs per table. Each table is equipped with a microphone. Large TVs are used: 45" rear projection TV as primary display, 35" tube as secondary display. Tables are arranged in amphitheater fashion so that all students are seated within a 90-degree arc originating from the center of the primary TV to assure adequate visibility. The secondary TV is located to the left of the primary TV. The primary TV shows outgoing video in the local classroom and incoming video in the remote class. The secondary TV shows students in the other class.

Each classroom has four TV cameras: (1) instructor, (2) easel camera, (3) class, and (4) auxiliary. A multichannel video switch is used to select which camera's signal to send to the other classroom. The instructor's primary camera is suspended above the second row of tables. The class camera is located above and behind the main TV. The instructor's auxiliary camera is suspended forward of the primary camera and to its right so that it covers an area that might be used for a writing board; though provided, this camera was never used during training and is optional unless the instructor must use a writing board.

The instructor wears a continuously-on, wired, clip-on lavaliere microphone and stands behind a lectern at the front of the classroom to the left of the primary TV. The video switch (a small panel with seven pushbuttons) is attached to the side of the lectern so that the instructor can reach down and switch cameras. On the table to the instructor's left are an easel camera and two 13" TVs; one shows outgoing video and the other incoming video. Each classroom is equipped with a facsimile machine and telephone (intercom) connected to other classroom(s) via ring-down telephone circuits.

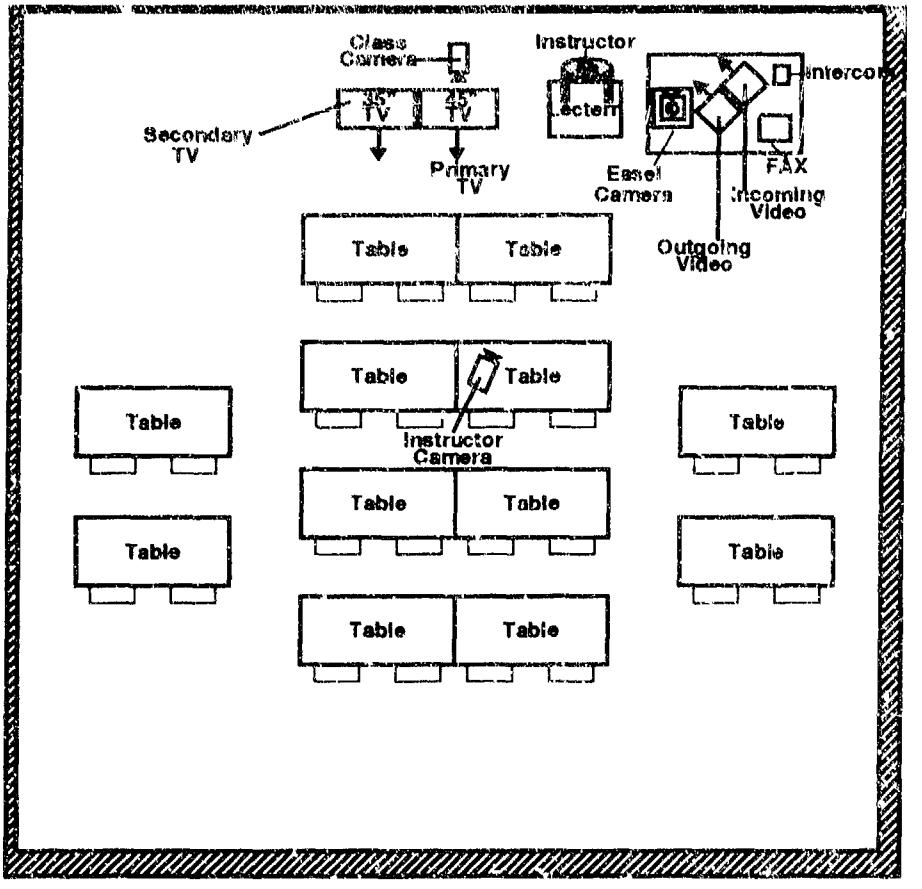


**Figure 2. VTT classroom floor plan for lecture-based training course (Model 1).**

### Model 2: Lecture/Demonstration with Hands-on Laboratory

Model 2 was developed after an analysis of the Damage Control Petty Officer course. This course includes lectures, but the instructor uses few transparencies. Much of the course consists of demonstrations with training aids of various sizes (e.g., fire extinguisher, marine strainer, hatch), which are moved in and out of the front of the classroom. Several videotapes are shown during the class. Students engage in discussion with the instructor and each other. The course also includes a hands-on laboratory where students perform disassembly/assembly and adjustment tasks. During lecture/discussion portions of the course, most of the information flows from the instructor to students. During laboratories (conducted off line) students work in small groups and help each other, under instructor supervision. The instructor spends some time behind a lectern, but more time performing demonstrations directly in front of the class.

Figure 3 shows the floor plan for a Model 2 classroom. The floor plan is similar to that of Model 1 with these differences:

1. Tables on the left side of the classroom are removed to provide storage space for training aids.

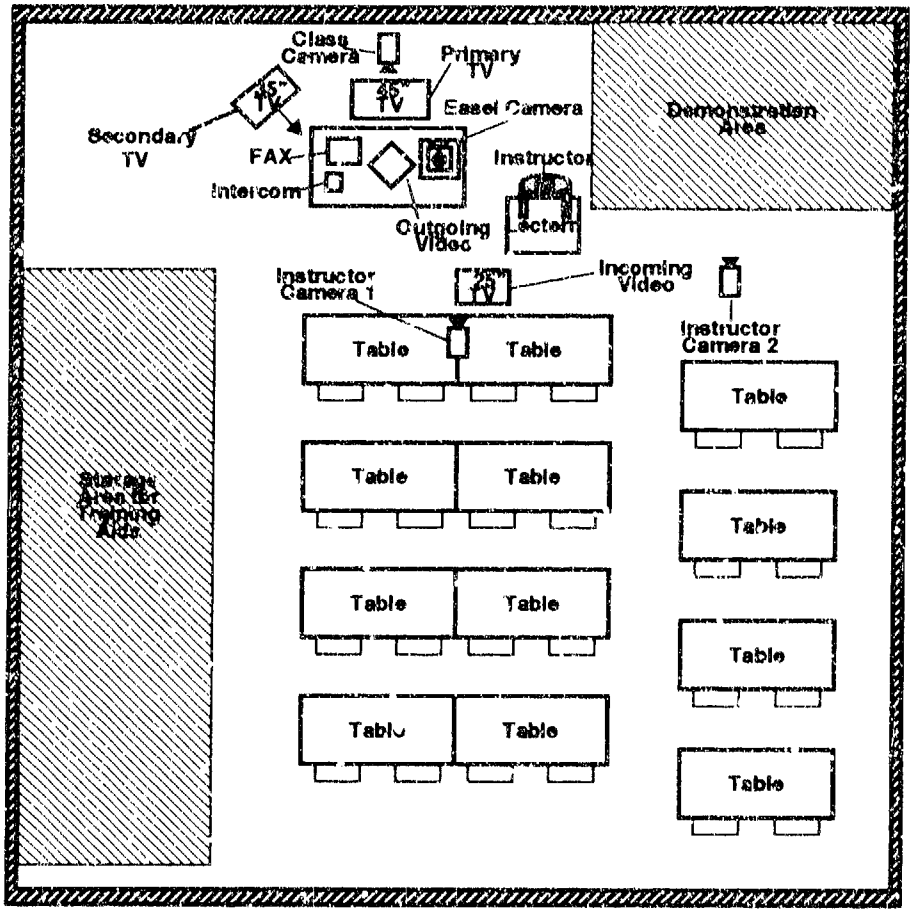


**Figure 3. VTT classroom floor plan for training course involving lecture/demonstration and hands-on laboratory (Model 2).**

2 Remaining tables are moved back to provide space for training aid demonstrations.

3. Instructor workstation is simplified and moved to instructor's right side.

4 VCR is provided.

5. Incoming video is shown on floor-mounted 25" TV display.

6. Instructor is provided with cordless microphone (needed for additional mobility).

**Model 3: Group Processes**

Model 3 was developed after an analysis of the Naval Leadership Course for Chief Petty Officers (NAVLEAD). This course uses some lectures, with transparencies, but most of the course consists of discussion and small-group activities. In the five class, students sit six to a table, with four tables in each room. Each group solves several problems as a team, and one of their number is elected to act as group spokesman before the entire class. The interactions occurring within the NAVLEAD class include instructor-class, instructor-team, team-team, team-class, and team spokesman-class. These varied interactions require a different classroom design.

Figure 4 shows the floor plan for a Model 3 classroom. This design provides space for 12 students, seated at two tables. Each classroom has four TV cameras: (1) easel camera, (2) instructor, and (3, 4) small group. A multichannel video switch is used to select which camera's signal to send to the other classroom. The instructor's camera is suspended between the rows of tables. A camera and microphone are suspended above each of the student tables. The instructor wears a continuously-on, wireless, clip-on lavaliere microphone and is free to move about the room, though to be seen he or she must remain within camera range. The video switch is attached to the side of the lectern. Each classroom is equipped with a facsimile machine and each table in a remote classroom is equipped with a telephone (not shown) that can be used to communicate with the instructor.

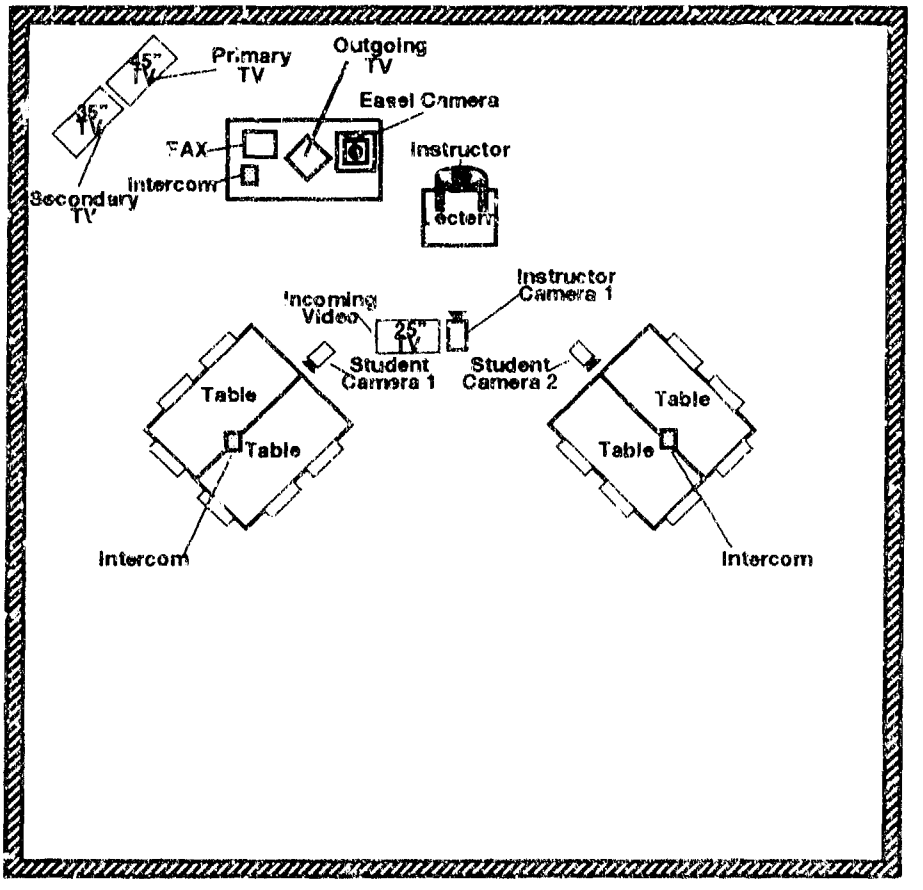


**Figure 4. VTT classroom floor plan for training course involving group processes (Model 3).**

Students make presentations by coming to the front of the classroom and taking the instructor's position. The instructor can interact with small groups in the local classroom by table hopping. To interact with a small group in a remote classroom, that group's camera is switched on and a spokesman speaks to the instructor using the telephone.

# Recommendations

1. The Chief of Naval Education and Training and the Naval Education and Training Program Management Support Activity should distribute this report's conversion methodology and VTT instructor training recommendations within the Navy VTT community for utilization and refinement.

2. The Chief of Naval Education and Training should form a panel of Navy VTT experts to document the final conversion methodology and instructor training recommendations in a NAVEDTRA instruction that may be used by the Navy training community.

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# Appendix A

# Conversion Methodology

# Conversion Methodology

## 1.0 Preparation

### 1.1 Working Group

Form a working group to perform the conversion. The group should contain a minimum of three members. Members should have sufficient time to devote to the effort and should be technically qualified. The suggested composition of the group is: (1) training/education specialist, (2) subject-matter expert (e.g., instructor), and (3) audiovisual specialist. Group members must possess expertise in these three areas, but may not have these specific job descriptions. In addition, it is highly desirable for the group to include a member with expertise in training evaluation.

The group may be assigned a chairperson or may elect one from its own membership. The group's highest priority is to assure that the integrity of training is preserved following conversion. For this reason, it is desirable for the chairperson to be sensitive to the impact of training conversions upon student learning and acceptance. In general, the person best qualified for this role is a training/education specialist.

### 1.2 Planning

Conduct an initial meeting of the working group to plan the conversion. Key agenda items are to: (1) identify conversion tasks, (2) define team member's roles and responsibilities, (3) set conversion milestones. Details of these items can be filled in by noting that:

1. The conversion tasks should be based on steps 2 through 6.

2 In general, team member roles and responsibilities should reflect their area of expertise. For example: (a) training/education specialist focuses on conversion of training activities, materials, aids, media, testing, administration, and supervision; (b) subject-matter expert assures integrity of instructional content; and (c) audiovisual specialist focuses on classroom design.

3. Conversion milestones are based on conversion task priority and available resources.

## 2.0 Data Collection

### 2.1 Live Classroom Floor Plan

Visit the classroom(s) in which live training occurs. Draw a scaled diagram of a typical classroom showing the locations of students, instructor, and other personnel; audiovisual equipment, drawing boards, and furniture; training aids; doors and windows; and other physical objects and attributes.

### 2.2 Observations

Observe the live training course and record descriptive information in a written log. It is helpful if group members observe the course together and later compile a collective log, though this is not usually critical if the team agrees on the rules for making log entries and each member follows them carefully. Record in the log information describing live classroom processes, physical locations of personnel, and timing. The content of log entries is explained below.

### 2.2.1 Live Classroom Processes

Classroom processes consist of training activities, testing, and supervisory and administrative procedures.

Training activities are the types of training events that occur in the classroom. Examples are lecture, class discussion, written exercise, demonstration, laboratory, media delivery (e.g., videotape, transparency), small-group activity, reading, and testing. Identify each training activity as it occurs and record it in the log.

Training activities may employ training materials, aids, or media. Training materials are provided to students and are usually in written form. Examples are technical manuals, student handouts, and student exercise sheets. Training aids are the physical objects the instructor uses to support the presentation. Examples are equipment/hardware, tools, models, and simulators. Training media are the audiovisual materials the instructor uses to support the presentation. Examples are transparencies, writing boards, 35mm slides, and videotapes. Identify training materials, aids, and media and record them in the log.

Students are usually tested during training with written and/or performance tests. These tests must be administered and scored, and their results must be recorded and provided to students. Test security must be maintained. The testing process involves materials (tests, score sheets, records) and procedures (administration, security, scoring, recording, student feedback). Identify the testing materials and procedures used to conduct testing and record them in the log.

Training involves supervisory and administrative procedures. For example, a class leader is appointed, roll call is conducted, and work details are assigned; students are checked into the course; and students are informed about local command structure, messing, quarters, and parking. Identify the supervisory and administrative procedures used and record them in the log.

### 2.2.2 Physical Locations of Personnel

Physical locations of personnel (instructor, students, and possibly others) will usually change during the course. Track these locations so that the VTT classroom can be properly equipped with cameras and microphones to capture the picture and sound of training participants. Alternatively, personnel movements and locations may be altered in the VTT classroom. The most important movements to track are the instructor's. The instructor will usually move among different areas used for different purposes (e.g., lecturing, conducting demonstrations). Students might remain in a single seating area, or possibly move between their seating area and a laboratory area. Identify the locations of personnel across time and record them in the log.

### 2.2.3 Timing

Record the start and stop times of significant events in the classroom. These events reflect changes in training activities, physical locations of personnel, or use of training materials, aids, or media. This information is gathered to determine the relative proportion of time devoted in class to each type of event.

## 3.0 Analysis

### 3.1 Organizational Structure

Analyze the organizational structure of the class.

First, identify the types of individuals in the class. A class will always include trainers and students. It may include more than one type of trainer; for example, lecturer, laboratory supervisor, test proctor, facilitator. A class may include more than one type of student (e.g., regular [for credit], observer, class leader, small group spokesman). Examples: (1) a typical lecture-based course includes one or more lecturers, regular students, and a class leader; (2) a typical laboratory-based course includes lecturer, laboratory supervisor, regular students, and class leader.

Second, identify groups in the class. Every class includes at least one group of students, consisting of the entire class. Often, students will form small groups to work on exercises. These groups may be as small as two persons or may be larger. Some classes are structured so that a significant part of training consists of small-group activities. Trainers may also work as groups.

### 3.2 Communication Flow

Analyze the direction, content, and public/private nature of communication flow so that communication requirements can be met in the VTT classroom.

Communication flow refers to flow of information among the individuals and groups (see step 3.1) participating in training.

Communication flow in Navy classrooms generally serves one of the following purposes: (1) information transfer (e.g., instructor imparts information to students), (2) supervision/administration (e.g., instructor or class leader assigns work to cleaning detail), (3) socializing.

Communication flow may be either (1) public or (2) private. Most will be public, but sometimes privacy is important (e.g., student asks instructor question during a testing period, class leader counsels a subordinate).

### 3.3 Classroom Functional Areas

Determine the functional areas in the classroom based on step 2.2 and mark them on the scaled drawing created during step 2.1.

Functional areas are classroom areas that are used for different purposes. Examples are instructor lecture area (e.g., surrounding lectern), (2) instructor demonstration area (where instructor performs demonstrations), (3) laboratory area (where students perform laboratory activities), and (4) student area (where students listen to lectures).

## 4.0 Training Design

The goal of training design is to provide the highest fidelity and most fully interactive instruction, as discussed in steps 4.1 through 4.4.

### 4.1 Training Activities

Conduct an analysis based on the data gathered during step 2.2 to determine how training activities will have to be modified for VTT. The required modifications typically involve (1) interaction protocols, (2) facilitators, (3) training procedures, and (4) hardware techniques. These are discussed next.

Interaction protocols are rules governing how personnel interact with one other. For example, remote students might be instructed to attract the instructor's attention by stating aloud that they have a question or comment rather than raising a hand that might not be seen by the instructor. Interaction protocols are one of the most important strategies.

Facilitators are personnel at remote sites who act as stand-ins for the instructor or other training personnel. A facilitator might be used to hand out training materials, grade tests, or conduct labs. At least one facilitator is usually required at each remote site.

Training procedures may have to be modified. For example, if remote students cannot see a live demonstration well on TV, it might be carefully videotaped and played back at remote sites. (Videotaping frees the instructor of time pressures and allows a more elaborate demonstration in terms of camera angles, editing, and other production details.)

Hardware techniques refers to the use of equipment to overcome a constraint. For example, remote students might be provided with individual headphones and TV displays to improve their ability to see and hear the instructor.

**4.2 Training Materials, Aids, and Media**

Conduct an analysis based on the data gathered during step 2.2 to determine whether these items can be used directly or must be modified for VTT training. The training requirements underlying the use of training materials, aids, and media must be met with VTT training.

Training materials such as technical manuals, student handouts, and student exercise sheets usually pose no problems for use with VTT (though there is a logistical problem in assuring that the materials are delivered to remote sites). Determine whether modifications are needed for VTT and, if so, note what modifications are required.

Training aids such as equipment/hardware, tools, models, and simulators often pose problems for VTT. Determine whether or not it is possible to present the training aids on camera effectively. If it is possible, determine the implications in terms of camera positioning, lighting, and other technical matters. If this cannot be done satisfactorily, consider alternative methods to meet the training requirements. Among the possibilities: (1) develop new training aids that can be presented on camera, (2) have a facilitator at the remote site demonstrate the training aid, or (3) eliminate the training aid and have the student satisfy the objective with on-the-job training. The answers to such technical problems are not always obvious. If in doubt, experiment to find the best approach.

Training media such as transparencies, writing boards, and videotapes often pose problems for VTT. VTT training must meet the same audiovisual requirements as live training, but not always in the same way. For example, projected transparencies do not pick up well on camera; it is preferable to convert them to hard copy for use with an easel camera. A writing board is awkward to use on camera and an easel camera is generally superior. The use of other training media may pose other technical

problems. The answers to such technical problems are not always obvious. Again, if in doubt, experiment.

### 4.3 Testing

Conduct an analysis based on the data gathered during step 2.2 to determine how the testing process and materials will be handled with VTT. Usually no changes are required for the local classroom. However, at remote sites procedures must be established to deliver tests to the site, keep them secure, administer them, score them, record results, and provide feedback to students. One common way to handle on-site activities is to use an instructor surrogate (i.e., test proctor or facilitator).

### 4.4 Supervision and Administration

Conduct an analysis based on the data gathered during step 2.2 to determine how supervisory and administrative procedures will be handled with VTT. Usually no changes are required for the local classroom. However, at remote sites, procedures must be established to check in students, appoint a class leader, conduct roll call, maintain discipline, inform students about local command structure, and handle other supervisory and administrative details. It is generally necessary to have both a facilitator and class leader at remote sites.

## 5.0 VTT Classroom Design

### 5.1 VTT Classroom Floor Plan

Create the initial floor plan based on the scaled diagram prepared during step 2.1. Divide the room into same functional areas identified in step 3.3.

The VTT classroom floor plan defines the locations of classroom functional areas; students, instructor, and other personnel; audiovisual equipment, writing boards, and furniture; training aids; doors and windows; and other physical objects in and attributes of the classroom. As a general rule, the floor plan should resemble that of the corresponding live class. Floor plans of local and remote classrooms should be identical, unless there is a logical reason to make them different.

Consider how the design may be simplified. One way this may be possible is to reduce the number of functional

areas. Each area generally has separate audio and visibility requirements, implying separate cameras/ microphones. If the number of areas can be reduced, these requirements diminish. Some design guidelines based on NPRDC's experience are provided in step 5.2.

## 5.2 Guidelines for VTT Classroom Design

### 5.2.1 Lighting and Color

A windowless, air-conditioned classroom is the ideal as it provides complete control over lighting and ventilation. If this is unavailable, provide adjustable window coverings (e.g., blinds) so that external light can be controlled.

Balance lighting system for color temperature of 3200 Kelvin (tungsten) to assure natural flesh tones on camera. Provide adjustable light levels with dimmers and separate switches for each lighting circuit.

Paint walls of room neutral gray or light blue.

### 5.2.2 Sound Conditioning

Use an acoustically-tiled ceiling. Carpet the room, if possible, to reduce echoes. Additional sound-control measures: hang draperies or acoustic foam on (1) rear wall, (2) left and right sides of front wall, and (3) side walls.

Assure that room has adequate ventilation. Do not use window air conditioners or fans as they are significant sources of noise.

### 5.2.3 Classroom Preparation

The classroom should resemble a conventional classroom to the maximum extent possible and not look like a TV studio. Suggestions:

1. Locate TV equipment that does not have to be operated by instructor (e.g., mixers, codec, power supplies) outside the classroom, behind panels, or concealed elsewhere within room.

2. An elevated floor with cables running underneath is desirable. If this is not possible, cover floor cable runs with rubber protection strips.

3. Hide cables, wires, etc. from sight.

4. Remove extraneous objects, cables, displays, etc., from background behind instructor; this area should be clear to provide an uncluttered backdrop when instructor is on camera.

**5.2.4 Instructor Area**

Provide the instructor with a movable lectern and a workstation (e.g., custom-built rack or table with (1) easel camera, (2) small TV (5"-10") showing easel camera output (for graphics orientation), (3) telephone (see below), (4) switches and controls managed by instructor, (5) facsimile machine, (6) computer, and (7) VCR). Allow instructor to locate workstation and arrange equipment to suit individual preferences.

**5.2.5 Student Area**

The most convenient way to seat VTT students is at tables (typically 24"-30" X 60"-72"), with two students per table. Minimum recommended distance between rows: 24"; 30" is preferred. If a single large TV is used, arrange tables in amphitheatre (i.e., fan) fashion so that all tables fall within a 90 degree arc from center of main TV. If multiple smaller TVs are used, tables may be arranged in rows. Whatever the table arrangement, locate tables within minimum and maximum viewing distances from TV displays. Minimum recommended viewing distance is 1.5 times the screen diagonal; maximum is 4 times the screen diagonal. The maximum distance may be extended to 8 times the screen diagonal if it is not critical for students to observe details of the picture (e.g., if it contains a "talking head" and does not display graphics). Utz (1992) provides an excellent summary of classroom video considerations and human factors guidelines.

**5.2.6 Other Classroom Functional Areas**

If the course requires demonstrations with 3-dimensional objects, provide a "demonstration" area (i.e., a table or open space covered by a separate camera to which the instructor can switch).

If the instructor must use a writing board rather than easel camera, provide a writing board and separate camera, which may be switched to by instructor.

**5.3 Audio Requirements**

Satisfy the audio requirements by providing microphones to those who must communicate. In general, every student will require a microphone (or perhaps share a microphone

with others), the instructor will require a microphone, each classroom will require a public address system to deliver public communications, and each classroom will require a private link to other classrooms.

Audio requirements are governed by the communication flow (information transfer and supervision/administration) determined in step 3.2. Each mapped communication path implies a requirement to provide an audio link. The links are of three basic types:

1. Face to face (no electronic link required).

2. Public (microphone and public address system required for each communicator).

3. Private (telephone required for each communicator).

Consider how the design may be simplified. Some possible ways: have students share microphones, provide a single telephone to enable private communications.

Audio system design is complex and may require the designer to consult audiovisual specialists. Some design guidelines based on NPRDC's and the CESN's experiences are provided in step 5.4.

## 5.4 Guidelines for VTT Classroom Audio

### 5.4.1 General

Audio is arguably the most important aspect of VTT and one of the most difficult to handle. VTT systems commonly experience problems with (1) sound that is too soft or too loud, (2) poor sound quality, (3) feedback, (4) echoes, (5) noise interference, and (6) failure by VTT students to follow microphone procedures.

### 5.4.2 Controlling Sound Problems

Minimize sources of external noise (e.g., air conditioners, blowers, lawn mowers) and classroom noise (e.g., pencil tapping, talking, shuffling papers).

**5.4.3 Microphones**

Provide the instructor with a light, wireless, clip-on microphone. Gate instructor's microphone on continuously (not sound-activated).

Provide one microphone for every student or pair of students. Avoid tripod-mounted or free-standing microphones. Isolate microphones from sources of table noise by mounting them on goosenecks, insulating table-mounted microphones with carpet or other material, or suspending microphones from ceiling. Use push-to-talk (not sound-activated) microphones.

**5.4.4 Sound Mixers/ Public Address System**

Locate incoming audio loudspeaker at the front of the classroom. In local classroom, avoid locating speaker where it may produce a feedback loop with instructor's microphone. Locate loudspeaker as far as possible from student microphones to avoid feedback.

Provide the instructor with a mute switch to turn off student microphones (local and remote).

**5.5 Visibility Requirements**

Provide each classroom with sufficient video monitors to satisfy the visibility requirements. In general, each classroom must be provided with a minimum of two displays to show (1) incoming video and (2) outgoing video. The number, locations, and sizes of monitors must be based on who must see what and from where.

Visibility requirements, like audio requirements, are governed by the communication flow (information transfer and supervision/administration) determined in step 3.2. Each mapped communication path implies a requirement to provide a video link. However, video links are not as critical as audio links in most situations; if communication can occur via an existing audio link, a parallel video link may be unnecessary.

The most critical video links are those involving the instructor (e.g., showing the instructor on camera during lectures and demonstrations, and enabling the instructor to present graphics to students with an easel camera). The visibility of students on camera is less critical, though it may be desirable in some training situations; it may be possible to use a single camera to cover an entire class of

students. If students work in small groups, it may be necessary to provide a camera to cover each group. When multiple cameras are used, a video switch must be provided to select which camera is sending its output to other sites.

The selection of cameras, monitors, and other aspects of video is complex and may require the designer to consult audiovisual specialists. Some design guidelines based on NPRDC's experience are provided in step 5.6.

## 5.6 Guidelines for VTT Classroom Video

### 5.6.1 General

The recommended method to mount cameras is to suspend them from the ceiling on adjustable rods rather than to mount them on tripods. A tripod-mounted camera may be required if the camera must be hand operated or frequently reoriented.

Separate cameras are required to cover each functional area in the classroom. Select good-quality TV cameras, preferably with zoom lenses. Provide the instructor with a dedicated easel camera that has convenient zoom and focus controls (e.g., Elmo or Sony VID-P11); do not use a conventional camera on a copy stand.

Provide the instructor with a video switch to control which camera or video source (e.g., VCR, laser disk player, computer) is on. Use a mechanical switch which can be controlled by touch without viewing; avoid complex, multi-button infrared remote controls.

### 5.6.2 TV Displays

Mount TVs high enough to be seen from back rows, with the center of all displays at the same height; 25" and 35" TVs may be mounted on standard TV racks (typically 54" high). Projection TVs 45" and larger will have to be mounted on tables or custom-built stands.

Provide students with one or more TVs showing incoming video. For classes of moderate size (24 or fewer students), a single 45" TV is a reasonable choice. A smaller display (e.g., 25"-35") will not usually provide adequate coverage to the entire class and a larger display will require a larger classroom so that all students can sit within recommended

viewing distances. Multiple smaller TVs may be used instead of a single large TV.

Provide the instructor with a separate TV showing incoming video. The ideal is for the instructor to be able to view this display on the same line of sight as the live class he/she is facing. Options, in order of desirability are: (1) medium (25"-35") TV suspended over students facing instructor, (2) medium (25"-35") TV on floor in front of students facing instructor, (3) large (35"-45") TV on rack at rear of room, and (4) small (10"-13") TV in instructor workstation.

In the local classroom, present outgoing video on the main TV. It is optional to provide instructor with a separate TV.

In remote classrooms, it is optional to present outgoing video to the class; this is not generally recommended.

### 5.7 Audiovisual Equipment

The selection of audiovisual equipment is governed by the audiovisual requirements determined in step 2.2.1. Provide audiovisual equipment to meet each of the requirements identified (e.g., easel camera, computer display, VCR).

## 6.0 Implementation and Refinement

### 6.1 Implementation

When VTT training design is complete, implement the design. Modify training materials, aids, and media, as necessary. Any new procedures should be documented in a course notebook. Likewise, when VTT classroom design is complete, implement the design (i.e., install, test, and make operational microphones, cameras, TV displays, etc.).

### 6.2 Instructor/Facilitator Training

Familiarize personnel who will conduct VTT (e.g., instructors, facilitators) with VTT training materials, aids, media, and procedures. The content of instructor training is beyond the scope of this document. Appendix C describes a 2- to-3 day VTT instructor training course based on NPRDC's practical experiences.

### 6.3 Pilot Course

Conduct a pilot course. The pilot has two objectives. The first is to familiarize trainers with VTT and enable them to develop their VTT skills. The second is to try out the VTT materials, aids, media, and procedures and to identify and correct problems. In general, it is desirable to minimize risks during pilot training. VTT should be delivered to actual students on a for-credit basis only after it has proved effective in the pilot.

### 6.4 Evaluation[4]

Evaluation occurs continuously during training. It has both informal and formal aspects. As problems are identified, they are typically corrected immediately, without waiting until the end of training; this is the informal aspect of evaluation. The formal aspect involves systematic data collection, analysis, drawing conclusions, and making recommendations for improvement. The content of evaluation is beyond the scope of this document. Formal evaluation should be planned and overseen by an experienced education specialist who has expertise in training evaluation.

### 6.5 Revision

Following evaluation, revise VTT materials, aids, media, and procedures. This is an ongoing process that should continue as long as training is being delivered.

[4]NPRDC and the Center for Naval Analyses have both previously conducted evaluations of VTT systems and described the procedures and evaluation instruments in technical reports (Rupinski & Stoloff, 1989; Simpson et al., 1990, 1991). It would be useful to readers who are performing evaluations to review these reports.

# Appendix B

# Course Conversion Checklist

# Course Conversion Checklist

[] Form a working group

Suggested composition:

- [] training/education specialist
- [] subject-matter expert
- [] audiovisual specialist
- [] training evaluation expert

[] Elect/assign chairperson

[] Hold initial meeting to plan conversion

Agenda:

- [] identify conversion tasks
- [] define member's roles and responsibilities
- [] set conversion milestones

[] Draw scaled diagram of classroom

Identify locations of:

- [] students, instructors, and other personnel
- [] audiovisual equipment
- [] writing boards and furniture
- [] training aids
- [] doors and windows
- [] other physical objects and attributes

[] Observe training

Log:

- [] training activities
- [] materials, aids, and media
- [] testing materials and procedures
- [] supervisory and administrative procedures
- [] physical locations of personnel
- [] timing

[] Analyze organizational structure

Identify:

[] types of individuals

[] groups

[] Analyze information transfer communication flow

[] list individuals and groups

[] determine communication flow

[] determine public/private nature

[] Analyze administrative communication flow

[] list individuals and groups

[] determine communication flow

[] determine public/private nature

[] Determine classroom functional areas

[] Convert training activities for VTT

[] Convert materials, aids, and media for VTT

[] Convert testing for VTT

[] Develop VTT classroom floor plan

[] create initial plan

[] design lighting and color

[] perform sound conditioning

[] prepare classroom

[] Determine audio requirements

[] map communication links

Determine:

[] face-to-face links (no electronic link)

[] public links (microphones & PA system)

[] private links (telephone)

[] provide microphones as required

[] Determine visibility requirements

Determine:

- [] video links
- [] cameras
- [] TV displays
- [] video switches

[] Select audiovisual equipment

[] Implement training

[] Train instructors and facilitators

[] Conduct pilot course

[] Conduct evaluation

[] Revise training

# Appendix C

# Suggestions for VTT Instructor Training

# Suggestions for VTT Instructor Training

## Overview

This appendix identifies training objectives and recommends content and organization of a short course to train Navy instructors to function effectively in a VTT classroom. The recommendations are based on NPRDC's experiences with the training of Fleet Training Center instructors to conduct VTT with lecture-based courses. It is assumed that VTT instructor trainees will be experienced Navy instructors. Regard the recommendations as suggestions rather than a rigid prescription. Adapt them to suit the specific requirements of the context in which they are applied.

It is estimated that training can be completed in 16-24 hours, preferably distributed over a week. The training should be conducted informally, with a small group (i.e., 2 to 4) of instructors.

The course content outline is divided into four parts. Part 1, The VTT System, is intended to familiarize the instructor with VTT equipment, classrooms, and equipment operation. The instructor needs to know how the equipment works, be able to recognize malfunctions, and should be able to correct minor problems when they occur. If technical support personnel are available, the emphasis on these topics may be reduced and training objectives (see below) may be modified accordingly.

Part 2, Preparation for Training, identifies items that should be completed before training starts (e.g., set up remote classrooms, handle logistics, etc.).

Part 3, Training Delivery, provides guidelines for student familiarization with VTT, training delivery, testing, and laboratories.

Part 4 is Practice Teaching. Though it occupies a small part of the outline, it typically represents 80 to 90 percent of total training time.

## Training Objectives

At the conclusion of training the VTT instructor trainee will be able to:

1. Deliver effective instruction in the VTT classroom.
2. Maintain order at local and remote VTT sites.
3. Train students to use VTT equipment and follow VTT procedures.
4. Maintain instructor/student dialogue among sites by following appropriate procedures.
5. Oversee remote-site logistics.
6. Oversee remote site laboratories, testing, and other activities requiring intra-site coordination.
7. Conduct classroom exercises, administer tests, and other training activities effectively at local and remote sites.
8. Operate VTT equipment.
9. Recognize the symptoms of VTT equipment malfunctions.

**Training Outline**

1. The VTT System

   System Overview

   Purpose of VTT

   VTT system architecture

   Originating site architecture

   Remote site architecture

   Purpose and Function of Each VTT System Component

      Audio mixers and microphones

      Cameras

      Intercom

      TV displays

      Video switches

      Lighting

      Other equipment

   Classroom Designs

      Local and remote classrooms

         Floor plans

         Functional areas

         Camera locations and angles of view

         TV display locations

         Microphone and mixer locations

         Instructor's workstation

         Acoustic and visibility constraints

   VTT Equipment Operation

   Recognizing and Correcting Malfunctions

2. Preparation for Training

   VTT classroom setup

   Remote-site Logistics

      Student enrollment

      Seating charts

Coordination of schedule, training, and administrative events with remote sites

Provision of training, laboratory, and testing materials at remote sites

Preparation for Remote-site Testing

Testing material adaptation

Testing procedure adaptation

Test security

Prepare Remote-site Laboratories

Adapt laboratory materials as necessary

Adapt laboratory procedures

"Dry Run" Practice Sessions

Test and refine training materials, aids, media, and procedures

Peers provide feedback

Practice presentation until it runs smoothly

3. Training Delivery

Preparing Students for VTT

Student familiarization with VTT equipment (e.g., use of microphones)

Student familiarization with VTT procedures

Appropriate and Inappropriate Classroom Behaviors

Face camera directly

Stay within camera's angle of view

Avoid rapid physical movements

Speak clearly

Switch cameras appropriately

Maintaining Order

Monitor comments from remote sites

Maintain control over class noise level

Maintaining Instructor/Student Dialogue

Questioning guidelines:

Monitor site responses; rotate among them consistently

Identify site by name

Identify student by name

State question

Listen/restate student's answer

Ask for concurrence/elaboration, as necessary

Answering guidelines:

Identify site by name

Identify student by name

Restate question/comment

Answer question

Maintain local/remote site interaction:

Encourage all students to use microphones

Call on students at remote site and solicit their comments

Periodically place local classroom students on camera

Conducting Laboratories

Coordinate with facilitator in conducting laboratories

Assure that safety precautions are observed

Provide effective remote-site demonstrations

Assure that student performance is certified

Administering Tests

Coordinate with facilitator in administering tests

Provide feedback to local/remote sites

Ensure student scores are recorded in student files

4. Practice Teaching

Provide instructors with platform time as needed

Recommended: 8 to 16 hours, distributed over 4 days

Recommended: Audience of peers to provide feedback

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